

Application No.: 10/790,502

Docket No.: 60680-1843

**REMARKS**

Applicants have carefully reviewed the final Office Action mailed May 25, 2005 and the Office Action mailed August 10, 2005 and thank Examiner Bissett for her detailed review of the pending claims. Claims 25 – 29 have been amended. Claims 32 – 38 have been added. Accordingly, claims 25 – 38 are pending in this application. Applicants respectfully request reconsideration of the present application in view of the following remarks. No new matter has been added.

**I. CLAIM REJECTIONS – 35 U.S.C. § 103****A. Rejection of claims 29 – 31 based on Pellegrini and Siebert**

The Examiner has rejected claims 29 – 31 under Section 103(a) as being unpatentable over US 4,197,178 (“Pellegrini”) in view of US 4,025,578 (“Siebert”). Applicants respectfully traverse the rejection.

Amended independent claim 25 is a process claim reciting that an epoxy nitrile resin is adapted to polymerize or to cross-link at generally ambient temperatures in response to infrared radiation and including the step of exposing the coating precursor on the fuel cell plate to infrared radiation to initiate polymerization or cross-linking.

Amended independent claim 29 is directed to an insulated fuel cell plate that includes a solid coating comprising an epoxy nitrile resin polymerized or cross-linked in response to infrared radiation at generally ambient temperatures.

**1. The teaching of Siebert should not be combined with Pellegrini**

The Examiner asserts that “Siebert teaches the use of compositions comprising epoxy resin, Polybutadiene-acrylonitrile rubber, and an amine crosslinking agent (example 1), where the mixture is cast onto a substrate and thermally cured (col. 7 lines 33 – 50).” *See Final Office Action dated May 25, 2005, pages 2 – 3, item 5 (emphasis added)*. Applicants disagree with this improper characterization of the reference. In fact, Siebert teaches using the elastomeric liquid polymer for “applications such as molded auto part and accessories.” *See col. 1, lines 25 – 26*.

Application No.: 10/790,502

Docket No.: 60680-1843

More specifically, in the very portion of the patent the Examiner alleged support of his position, Siebert states:

The liquid polymer, epoxy resin, dihydric compound, and amine and compounding ingredients (if used) are admixed using mixing kettles, Henschel mixers, ink mills, Banbury mixers, and the like, employing standard mixing procedures and techniques. Heating of the composition may be helpful to obtain dissolution and uniform dispersion of the materials. The mixture is casted, i.e. poured or injected into stationary molds, rotational molds, and the like, and **heated at about 110.degree. C. to about 180.degree. C.** The compositions of the invention can be readily used to make molded products using rotational casting techniques. The ability of the liquid polymer composition to be readily castable and, upon cure, to yield an elastomeric reinforced vulcanizate, is unique. Prior to this invention, reinforced liquid polymer compositions were not castable, or, if they were castable, only low tensile strength, soft vulcanizates, or high tensile strength, low elongation vulcanizates were obtainable.

*See col. 7, lines 33 – 44 (emphasis added).*

Siebert states that “the mix was **cured at 310° F. for 30 minutes**, and then tested.” *See col. 9, line 21 – 22.* Furthermore, Seibert states that “the four compositions above were easily poured into tensile sheet molds, viscosity of the mixes being about 2000 centipoises **at about 80° C.**” *See col. 9, lines 29 – 31.*

In stark contrast, the Applicants contemplate having an epoxy nitrile resin mixture that “unlike o-rings and molded inserts, the disclosed coating precursors can be quickly and precisely applied to fuel cell plates (e.g., by screen printing) resulting in substantial cost savings.” *See page 4, paragraph [0013].* “For instance radiation cured coating precursors can be cross-linked at much lower temperatures (e.g., **ambient temperatures**) than heat-cured reactive coatings precursors. This is an advantage when using graphite composite fuel cell plates than can warp at temperatures associated with heat-cured coatings.” *See pages 6 – 7, paragraph [0022].*

Therefore, Siebert does not teach, contemplate, or suggest having a mixture with properties and a viscosity that is capable of being applied to a surface of a component by a method such as screen printing as claimed in claim 26, much less being viscous without being raised to a temperature of about 80° C. *See col. 9, lines 29 – 31.* Siebert teaches that the mixtures disclosed are poured into a mold. *See col. 9, lines 29 – 31.* One skilled in the art would not take the teachings of Siebert and apply them to Pellegrini without extensive experimentation since

Application No.: 10/790,502

Docket No.: 60680-1843

varying the mixture amounts results in different properties including viscosity. Stated another way, the liquid carboxyl-terminated polymer that is mixed with an epoxy resin and a dihydric compound at various weights and ratios of polymer to epoxy in EXAMPLE 1 that is later poured into a mold for forming automotive components of Siebert would not suggest to one of ordinary skill in the art to apply that teaching to fuel cell assemblies after reading Pellegri because of the additional level of experimentation required to succeed.

In fact, Siebert would discourage one of ordinary skill in the art to use a carboxyl-terminated poly(butadiene-acrylonitrile) rubber of Siebert because the temperature required (80° C) to pour the mixture would warp the fuel cell. Specifically, "when using graphite composite fuel cell plates that can warp at temperatures associated with heat-cured coatings." *See pages 6 – 7, paragraph [0022].*

For at least these reasons, independent claim 29 is patentable over the prior art of record. Dependent claims 30 and 31 are patentable by virtue of their dependency on patentable claim 29. However, the dependent claims also contain additional limitations that are independently patentable. Withdrawal of the rejection is respectfully requested.

## **2. Radiation prevents warping over heating**

As admitted by the Examiner, neither Pellegri nor Siebert fail to teach coatings cured by methods other than heating. Instead, the Examiner takes the "position that the cured coatings of the reference would be indistinguishable from those cured by infrared radiation. It is the Examiner's position that the claimed cure process in this case would not provide a patentably distinct product." *See Final Office Action dated May 25, 2005, page 4, item 9.* Applicants respectfully traverse.

First, without explicitly so stating, the Examiner has taken Official Notice that the coatings cured by heating are indistinguishable from those cured by infrared radiation in the context of the claimed invention. Thus, Applicants again requests that support for the taking of Official Notice be provided as required by 37 CFR 1.104(d)(2) and MPEP 2144.04. The Examiner still has not provided support for the taking of the Official Notice. *See page 4, item 9.* As explicitly discussed in the patent application, the resulting product from heating exhibits

Application No.: 10/790,502

Docket No.: 60680-1843

“warping” and the resulting product from radiation does not as stated by the Applicants. “For instance radiation cured coating precursors can be cross-linked at much lower temperatures (e.g., ambient temperatures) than heat-cured reactive coatings precursors. This is an advantage when using graphite composite fuel cell plates than can warp at temperatures associated with heat-cured coatings.” See *pages 6 – 7, paragraph [0022]*.

Second, the application explicitly discusses the advantage of using radiation as opposed to heat in the context of the claimed invention. Thus, the Examiner’s suggestion that the two are interchangeable merely helps to confirm the non-obviousness of the claimed invention. Radiation-cured coatings overcome the problem of the separator plates warping when cured at the high temperatures necessary with heat-cured coatings. See *pages 6 – 7, paragraph [0022]*. Thus, the inclusion of the claim limitations in both independent claims 25 and 29 appropriately distinguishes the present invention from the prior art. The inventive fuel plate is claimed, and is distinguishable from the prior art since undesirable warpage is minimized in accordance with the teachings of the claimed invention.

Moreover, while acknowledging the problem of warpage, Pellegri addresses the issue in an entirely different way. It teaches adding hardeners to the gas-impermeable separator plates as opposed to using radiation-cured coatings. See *col. 4, lines 59-62 of Pellegri*. Thus, Pellegri teaches directly away from the claimed invention. However, the Examiner still maintains that “The applicant has not shown that the cure process provides a different product.” See *page 4, item 9*. The Applicants have shown a different product because Pellegri requires “two component resins of the epoxy or modified epoxy base with aromatic amines additives as hardeners.” See *col. 4, lines 47 – 49*. The claimed invention does not require these additives. **The claimed invention uses “an epoxy nitrile resin, which comprises an epoxy resin and an acrylonitrile butadiene copolymer.”** See *page 4, paragraph [0012]*. Therefore, the Applicants have at least shown a product that does not require aromatic amines additives as hardeners. As a result, the claims are patentably distinct. In contrast, The Examiner combines Pellegri with Siebert; specifically citing **EXAMPLE I** where Siebert uses a carboxyl-terminated poly(butadiene-acrylonitril) rubber. See *Siebert at col. 8, lines 40 – 41*. However, “the data shows that the vulcanizates have good elastomeric properties, especially tensile strength and elongation.” See *Siebert at col. 9, lines 11 – 13*. Again, Siebert would discourage one of ordinary

Application No.: 10/790,502

Docket No.: 60680-1843

skill in the art to use a carboxyl-terminated poly(butadiene-acrylonitrile) rubber and combine it with the teaching of Pellegrini because Siebert does not teach an aromatic amine additive as a hardener as contemplated in Pellegrini. Moreover, **Butadiene is not an aromatic** nor is an acrylonitril butadiene copolymer. Therefore, there is no teaching, motivation, or suggestion to combine Pellegrini with Siebert.

In addition, Siebert discloses in EXAMPLE I, a liquid carboxy-terminated polymer mixed with (A) an epoxy resin, (B) a dihydric compound, and a required (C) amine. *See col. 8, lines 37 – 40 of Siebert*. Pellegrini discloses using (D) two-component resins of the epoxy or modified epoxy base with (E) aromatic amines additives as hardeners. *See col. 4, lines 44 – 50 of Pellegrini*. In contrast, Applicants claim an epoxy nitrile resin, which comprises an epoxy resin and an acrylonitrile butadiene copolymer. *See page 4, paragraph [0012]*. Therefore, the coating precursor is not identical to either Pellegrini or Siebert.

For at least these reasons, independent claim 29 is patentable over the prior art of record. Dependent claims 30 and 31 are patentable by virtue of their dependency on patentable claim 29. However, the dependent claims also contain additional limitations that are independently patentable. Withdrawal of the rejection is respectfully requested.

### 3. Lack of Motivation to Combine

Independently of the complete lack of teaching of critical claim element in each of the independent claims, Applicant respectfully traverses the 103(a) rejections to independent claims 25 and 29 because there is no suggestion, motivation, or objective reason to combine the cited references. “If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue.” *In re Rouffet*, 47 USPQ2d 1453 at 1457 (Fed. Cir. 1998). “Rejecting patents solely by finding prior art corollaries for the claimed elements would permit an examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be ‘an illogical and inappropriate process by which to determine patentability.’” *Id.* quoting *Sensonics, Inc. v. Aerosonic Corp.*, 81 F.3d 1566, 1570, 38 USPQ2d 1551, 1554 (Fed. Cir. 1996).

Application No.: 10/790,502

Docket No.: 60680-1843

*In re Oetiker* further provides that “[t]here must be some reason, suggestion, or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the combination.” “The examiner must show reasons that the skilled artisan, confronted with the same problem as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed. *In re Rouffet*, 47 USPQ2d 1453, at 1458 (Fed. Cir. 1998).

As established by Federal Circuit precedent, to establish a *prima facie* case of obviousness, the examiner must provide some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. *See, e.g., Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985) (“To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references”); *In re Geiger*, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987) (“When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references”; *ACS Hosp. Sys. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984) (“Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination”); *accord*. MPEP 2143.

It is established law that one “cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.” *Ecolochem, Inc. v. Southern Cal. Edison Co.*, 227 F.3d 1361, 1371, 56 USPQ2d 1065 (Fed. Cir. 2000) (citing *In re Fine*, 837 F.2d 1071, 1075, 5 USPQ2d 1780, 1783 (Fed. Cir. 1988)). Indeed, “[c]ombining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor’s disclosure as a blueprint for piecing together the prior art to defeat patentability – the essence of hindsight.” *In re Dembiczak*, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). Moreover, “[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.” *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

Application No.: 10/790,502

Docket No.: 60680-1843

Applicants respectfully submit that it is inappropriate to combine Pellegri and Siebert to reject the claims since there is no suggestion to combine. The alleged motivation for combining the claims comes from a statement by the Examiner and not from either one of the references. There is nothing in either Pellegri or Siebert that would lead one of ordinary skill in the art to take the type of coatings that are in Siebert and use them as gaskets in Pellegri.

Moreover, the alleged motivation itself has nothing to do with the claimed invention. The Examiner talks about the motivation being that "the epoxy compositions of Siebert's invention are castable and hence more easily applied". The claimed invention teaches away from castability. Instead, a coating is applied and then the coating is cross-linked in response to infrared radiation. As stated above, the Examiner combines Pellegri with Siebert; specifically citing EXAMPLE I where Siebert uses a carboxyl-terminated poly(butadiene-acrylonitril) rubber. *See Siebert at col. 8, lines 40 – 41.* However, "the data shows that the vulcanizates have good elastomeric properties, especially tensile strength and elongation." *See Siebert at col. 9, lines 11 – 13.* Again, Siebert would discourage one of ordinary skill in the art to use a carboxyl-terminated poly(butadiene-acrylonitrile) rubber and combine it with the teaching of Pellegri because Siebert does not teach an aromatic amine additive as a hardener as contemplated in Pellegri. Moreover, **Butadine is not an aromatic** nor is an acrylonitril butadiene copolymer. Therefore, there is no teaching, motivation, or suggestion to combine Pellegri with Siebert.

For at least these reasons, independent claim 29 is patentable over the prior art of record. Dependent claims 30 and 31 are patentable by virtue of their dependency on patentable claim 29. However, the dependent claims also contain additional limitations that are independently patentable. Withdrawal of the rejection is respectfully requested.

**4. The Dependent claims are also patentably distinct.**

In addition to the patentability of independent claims 25 and 29 over the combination of Pellegri and Siebert for the reasons discussed above, the dependent claims are also independently patentable. For example, the Examiner does not show how the combination of

Application No.: 10/790,502

Docket No.: 60680-1843

the two references teaches applying the coating precursor using screen printing as recited in claim 26.

Further, the prior art does not teach the importance of having the coating precursor exposed to infrared radiation for less than about forty five minutes, as recited in claim 27 or less than about thirty minutes as recited in claim 28. As discussed in the application, these times are required for the appropriate chemical reaction to take place with respect to the precursor coating when subjected to radiation. [See, e.g., Paragraph 0021]

With respect to claim 30, neither of the references teaches a coating less than about 250  $\mu$  thick or less than about 150  $\mu$  thick as recited in claim 31, such that the coating is exposed to infrared radiation. The Examiner talks about the choice of coating thickness to balance cost and insulation properties of the cell structure as rendering the coating thickness selected as being obvious. However, the application itself gives substantially different motivations for the choice of the coating thickness:

As can be seen in Fig. 1 and Fig. 2, the plates 106, 108 include a resilient coating 132, which is applied on either or both of the major surfaces 122, 124 of the plates 106, 108. As noted above, the coating 132 prevents mixing of disparate fluid streams during operation of the fuel cell assembly 100, and prevents electrical conduction among adjacent plates 106, 108. In addition, the coating 132 is chemically resistant to heat transfer fluids and electrolytes used in the various types of fuel cells, does not substantially interfere with fuel cell chemistry, is thermally stable at operating temperatures, and exhibits good adhesion to the plates 106, 108. The thickness and mechanical properties of the coating 132 will depend on the dimensions and properties of the plates 106, 108 and the active portion 104 of each of the fuel cells 102. Typically, however, the coating 132 is about 50  $\mu$  to 250  $\mu$  thick, has a tensile strength greater than about 500 psi, an elongation greater than about 100 percent, and a Shore A hardness between about 45 and about 85.

[Paragraph 0019]. Thus, the choice of coating thickness is non-obvious in the context of the claimed invention and one of the patentable aspects.

Accordingly, in view of the foregoing, the pending claims are patentably distinct over the combination of Pellegrini and Siebert.



Application No.: 10/790,502

Docket No.: 60680-1843

**B. Rejection of Claims 25 and 27 – 28 based on Pellegri and Ying**

Claims 25 and 27-28 were rejected under Section 103(a) as being unpatentable over Pellegri in view of US 6,183,901 ("Ying"). Applicants respectfully traverse the rejection.

Amended independent claim 25 teaches away from Pellegri for the reasons stated above. Further, there is no motivation or suggestion to combine Pellegri and Ying to result in the claimed invention. Pellegri teaches gas-impermeable separator plates having a heat-curable coating. Pellegri fails to mention coatings cured by methods other than heating, such as infrared radiation, as claimed in the present application. Specifically, Pellegri also fails to disclose epoxy nitrile resins as claimed by the Applicants. To fill the deficiencies in Pellegri, the Examiner uses Ying. The Ying patent discloses porous separator plates having a protective coating cured by heat, UV light, visible light, infrared radiation or electron beam radiation. The Ying patent presents this list of available methods and then specifically teaches the use of UV lamps to cure the coating. Ying also fails to disclose epoxy nitrile resins as claimed by the Applicants.

As discussed above, gas-impermeable separator plates, as in Pellegri and the present invention, tend to warp under the high temperatures necessary to cure heat-curable coatings. Meanwhile, porous separator plates, as in Ying, are made from a substantially different composition and do not tend to warp under high temperatures. Therefore, porous separator plates may withstand any variety of curing techniques including heat or infrared radiation. In contrast, to overcome the problem of warpage Pellegri teaches adding hardeners to the gas-impermeable separator plates. The claimed invention overcomes the warpage problem associated with gas-impermeable separator plates by curing the coating precursor with infrared radiation, instead of heat. Accordingly, there is no motivation or suggestion to combine the teachings of the Pellegri regarding gas-impermeable separator plates having hardeners and receiving heat with Ying regarding porous separator plates receiving infrared radiation.

Further, the Pellegri patent, in fact, teaches away from using infrared radiation to polymerize or cross-link the coating precursor applied to gas-impermeable plates. The Pellegri patent teaches adding aromatic amines to the separator plates to prevent the separator plates from warping under the high temperatures necessary to cure the coating (see column 4, lines 59-62 of the Pellegri patent). Aromatic amines are hardeners and permit the separator plates to

Application No.: 10/790,502

Docket No.: 60680-1843

withstand higher temperatures. Instead of adding hardeners, the coating of the claimed invention is subjected to infrared radiation instead of heat to polymerize or cross-link the coating. Teaching the use of aromatic amines by the Pellegri patent teaches away from using infrared radiation as in the claimed invention. As stated above, Pellegri teaches an aromatic amine additive as a hardener. **Butadine is not an aromatic** nor is an acrylonitril butadiene copolymer.

With respect to dependent claims 27 and 28, the Examiner does not point to any teachings in either reference that recite these limitations in the context of the claimed invention. Thus, these claims are independently patentable.

**C. Claim 26 based on the Combination of Pellegri, Ying and Canfield**

The arguments made with respect to the combination of Pellegri and Ying are applicable to the rejection of claim 26. Further, however, claim 26 is patentably distinct because there is no motivation to combine the references. The motivation recited by the Examiner is not taught in any of the references and is inapplicable to the rationale for the claimed invention as set forth in the present application. Thus, the claim is respectfully submitted to be patentably distinct.

**II. New claims 32 – 38**

Applicants have added new claims 32 – 38 to articulate further aspects of the invention. Among other things, the claims recite a coating consisting essentially of an epoxy nitrile resin.

Application No.: 10/790,502

Docket No.: 60680-1843

**III. Conclusion**

In view of the above, each of the presently pending claims in this application is believed to be in condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

It is believed that any additional fees due with respect to this paper have already been identified in any transmittal accompanying this paper. However, if any additional fees are required in connection with the filing of this paper that are not identified in any accompanying transmittal, permission is given to charge account number 18-0013 in the name of Rader, Fishman and Grauer PLLC. If the Examiner has any question or comments, she is kindly urged to call the undersigned to facilitate prosecution.

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Respectfully submitted,

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